RESEARCH CENTRE FOR INTEGRATED MICROSYSTEMS (RCIM) REPORT
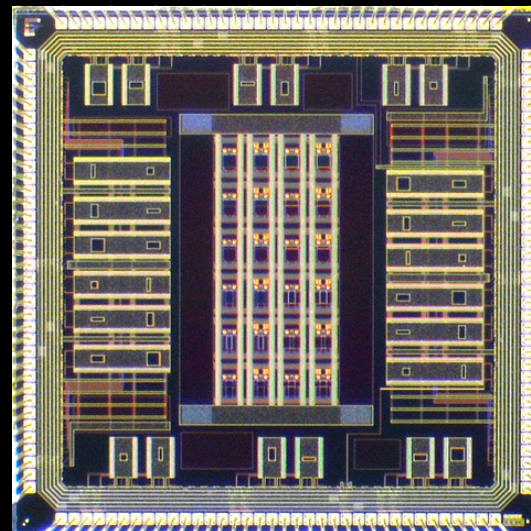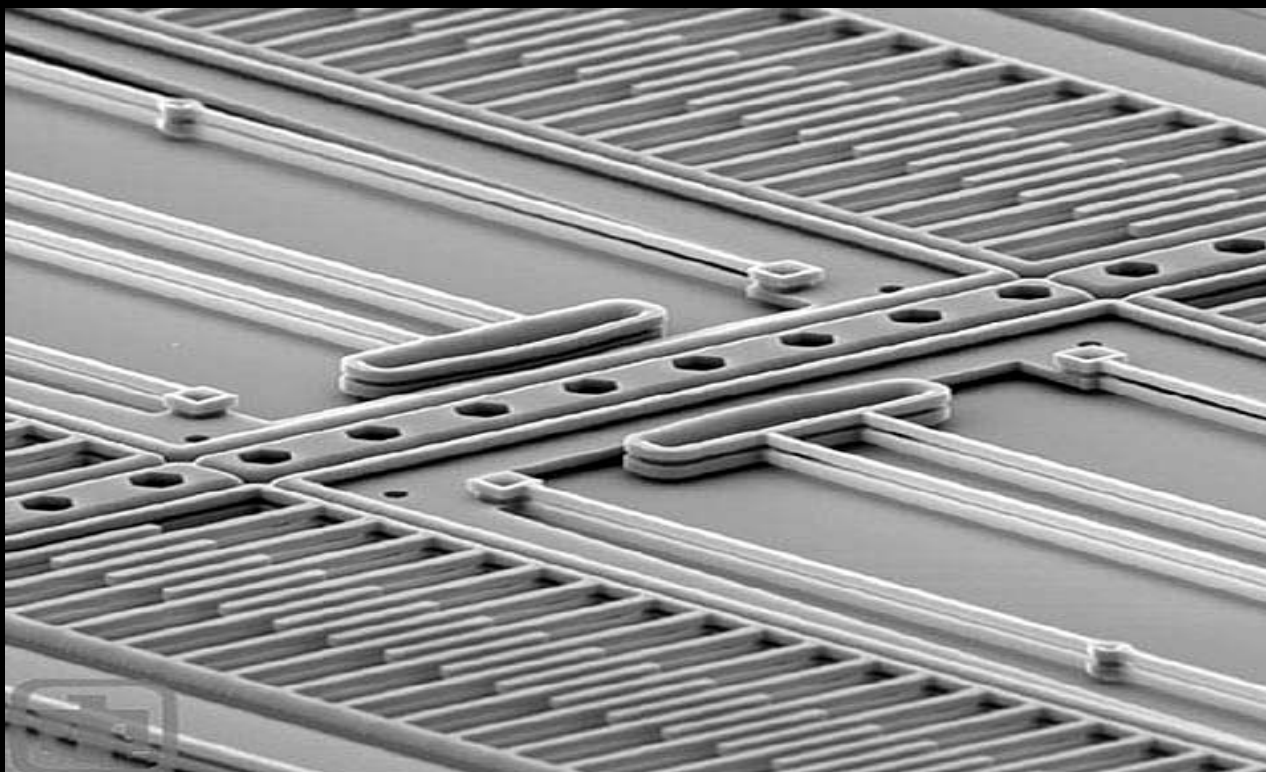## Jan. 01, 2007 – Jan. 01, 2008

Department of Electrical & Computer Engineering
University of Windsor

Director's Report for 2007

Research Centre for Integrated Miocrosystems (RCIM) within the Department of Electrical and Computer Engineering, in the faculty of Engineering at the University of Windsor was established in January 2000 by the support and encouragement from the President Ross Paul, Provost and Vice President Academic, professor Neil Gold and Dr. Graham Reader the Dean of Engineering. RCIM was mandated to carry out leading edge research, developing collaborative partnerships and educating highly qualified graduate students in various areas of Integrated Microsystems with applications in the fields of digital signal processing, communication, automotive electronics few to mention. RCIM currently has 11 active members (10 professors and one manager), 16 Ph.D. students and 21 MA.Sc. students who are using the research facilities.

In 2007 faculty members at RCIM graduated 3 Ph.D. and 16 MA.Sc. students. During 2007, our members received more than $1,400,000 in grants and contracts. During the same period, the results from our research work generated 59 papers which were published in premier Journals and top tier conferences. Also, our members were recipients of Dean's Special Recognition Award (Dr. Ahmadi & Dr. Chowdhury), Special Needs (OPUS), Campus Community Recognition Award (Dr. Muscedere) and our Ph.D. student Mr. M.J. Islam was recipient of the best Technical Award Certificate from 2007 International Conference for upcoming Engineers which was held in Toronto, Canada. RCIM members delivered 16 research seminars during 2007 and our members were active in organizing various international conferences such as IEEE-ISCAS, IEEE-ICECS, IEEE-MWSCAS during the same year.

On behalf of the RCIM faculty and student members I would like to express our sincere thanks for the continued support we have been receiving from Dr. Ross Paul, the President, Professor Neil Gold the Provost and Vice President Academic and Dr. Graham Reader the Dean of Engineering, at the University of Windsor. The support and encouragement received from Dr. Sid-Ahmed the Head of Electrical and Computer Engineering Department is very much appreciated. Finally we are thankful to CMC for providing us with a multi-million dollar state-of-the-art facilities allowing us to conduct research in the area of Integrated Microsystems and subsidizing our chip fabrication costs.

Majid Ahmadi, Ph.D., C.Eng., FIET, FIEEE
University Professor, Director

Areas of Specialization in RCIM

The Research Center for Integrated Microsystems within the Department of Electrical and Computer Engineering in the Faculty of Engineering at the University of Windsor is carrying out leading edge research, in the following areas:

1. **MICROELECTRONIC,** including:

   - High Speed DSP System
   - Computer Arithmetic
   - Encryption
   - Testing of Mixed Signal Integrated Circuits
   - Field Programmable Chips and Systems
   - CMOS and nanoelectronic circuits design

2. **MICROELECTROMECHANICAL SYSTEMS (MEMS),** including:

   - Sensors and Filters
   - Capacitive Microphones and 3-D Acoustical Sensing
   - Electromagnetic Microactuators
   - Acousto_Magnetic Transducers
   - Optical Switching MEMS
   - Automotive Sensors
   - Customs MEMS Sockets
   - Micro power Generators
   - Atomic Force Microscopy
   - MEMS RADAR

3. **Digital Signal Processing and Communication,** including:

   - Algorithms
   - Massively Parallel Arrays and Special Architects
   - Computer Vision and Image Processing
   - Pattern Recognition and Document Analysis
   - Network Security Management
   - Network Management

The projects vary from fundamental pre-competitive research to mission oriented research and technology transfer. There is an emphasis on problems requiring signal processing systems implemented with advanced integrated Microsystems.

I. RCIM MEMBERS

(A) Faculty Members:

Ten professors in Electrical and Computer Engineering carry out research and supervise graduate students as members of the Research Centre for Integrated Microsystems. The day to day operation of the Center is administered by the Manager of the RCIM who provides training for the new graduate students on how to use the facilities as well as maintaining the hardware and CAD tools used by the RCIM members.

1   Dr. Majid Ahmadi, Professor (Director, RCIM)
2. Dr. Shervin Erfani, Professor
3. Dr. Chunhong Chen, Associate Professor
4. Dr. Esam Abdel-Raheem, Associate Professor
5. Dr. Sazzadur Chowdhury, Assistant Professor
6. Dr. Roberto Muscedere, Assistant Professor
7. Dr. Mohammed Khalid, Assistant Professor
8. Dr. Huapeng Wu, Assistant Professor
9. Dr. Mitra Mirhassani, Assistant Professor
10. Dr. Rashid Rashidzadeh (RCIM Manager)
11. Dr. Stephen O'Leary (Associate Professor)

(B) Student Members:

RCIM has a track record of outstanding graduate outcomes. Our students have been very competitive in the job market and in admission to Ph.D. programs at major universities. Recent appointments to prominent positions include:

❖ RCIM Students Graduated in 2006 -2007

First name	Surname	Program	Supervisor	Date of Graduation	Thesis
Bhaskar	Ray	M.A.Sc.	Dr. Ahmadi	June 2007	Engine Defect Detection Using Wavelet Analysis
Payman	Samadi	M.A.Sc.	Dr. Ahmadi	July 2007	Design of High Throughput Recursive and Non-Recursive Digital Filters
Songtao	Huang	Ph.D.	Dr. Ahmadi	June 2007	Hidden Markov Model and Its Application in Document Image Analysis
Mitra	Mirhassani	Ph.D.	Dr. Ahmadi	June 2007	Computer Arithmetic Based on Continues Valued System
Rashid	Rashidzadeh	Ph.D.	Dr. Miller	May 2007	An Embedded Tester Core for Mixed-Signal System-on-Chip Circuits
Jason	Tong	M.A.Sc.	Dr. Khalid	Winter 2007	Efficient Quadratic Placement for FPGAs
Ian	Anderson	MASc	Dr. Khalid	January 19, 2007	DNLMS-Based Adaptive Filters for Echo Cancellation
Raymond	Lee	MASc	Dr. Khalid	Fall 2006	Software Profiling for an FPGA-Based CPU Core
Jason	Tong	MASc	Dr. Khalid	March 29, 2007	A Low Cost Processor Based Logic Emulation System Using FPGAs
Marwan	Kanaan	MASc	Dr. Khalid	Aug 22, 2007	FPGA Implementation of a Wireless Sensor Node
Junsong	Liao	MASc	Dr. Khalid	Dec. 7 2007	FPGA Implementation of a Wireless Sensor Node
Mahzad	Azarmehr	MASc	Dr. Muscedere	May 2007	A MDLNS based central processing unit
Carol-Lynn	Deck	MASc	Dr.R.Gaspar/Dr.M.Ahmadi	Jan.2008	Variability Analysis of Engine Idle Vibration
Mohammad I.	Haider	M.Eng	Dr. O'Leary	Sep. 2007	Ontario Power Generation and its Future
Yanjie	Mao	MASc	Dr. Chen	April 17, 2007	A Statistical Reliability Model for Single-Electron Threshold Logic
Walid	Mahmoud	MASc	Dr. Raheem	Aug. 2007	UWB for Multiple-Access with Differential-Detection Receiver
Reymond	Lee	MASc	Dr. Raheem	Jan. 2007	DNLMS-Based Adaptive Filters for Echo Cancellation
Harb	Abdulhamid	MASc	Dr. Raheem	Jan. 2007	Channel Estimation for 5.9 GHz DSRC Applications
James H.	Wiebe	MASc	Dr. Erfani	Sep. 2007	Implementing IPSec Using the Five-Layer Security Framework and FPGAs

❖ Current RCIM Students

First name	Surname	Program	Supervisor	Thesis Title
Peng	Chang	M.A.Sc.	Dr. M. Ahmadi	Low Power Digital Multiplier Design
David	Li	Ph.D.	Dr. M. Ahmadi	Low power Efficient Design of H.264/AVC
Mohammed	Islam	Ph.D.	Dr. M. Ahmadi/Dr.M.A. Sid-Ahmed	Computer Vision for Quality Process Control Application
Mahzad	Azarmehr	Ph.D.	Dr. M. Ahmadi	DSP Processor Based on Multi-Dimensional Logarithmic Number System
Iman	Makaremi	Ph.D.	Dr. M. Ahmadi	Application of Hidden Markov Model in Word Recognition
Farhad	Hajaliasghari	Ph.D.	Dr. J. Wu (Co-supervisor Dr. Ahmadi)	Power Management and Leakage Power Reduction Methods in Deep Sub-Micron Nodes
Golnar	Khodabandehloo	Ph.D.	Dr. Ahmadi (Co-supervisor Dr. Mirhassani)	Low-Power, Area Efficient Arithmetic Circuits with CVNS
Amir Hossein	Nabatchian	Ph.D	Dr. M. Ahmadi (Co-supervise with Dr. E. Abdel-Raheem)	On Human Face Recognition
Ashkan	Hosseinzadeh Namin	Ph.D.	Dr. M.Ahmadi(Co-supervise with Dr. H.Wu)	VLSI implementation of an Elliptic Curve Processor
Jack	Wong	M.A.Sc.	Dr. C. Chen (Co-supervised with Dr. J. Wu)	TBA
Mohammed	Berhea	M.A.Sc.	Dr. C. Chen	Low power design for Radio-frequency identification
Bingxi	Li	M.A.Sc.	Dr. C. Chen	Memory design using single-electron devices
Venketeshw	Puthucode	Ph.D.	Dr. C. Chen	TBA
Guoqing	Deng	Ph.D.	Dr. C. Chen	TBA
Hongmei	Zong	M.A.Sc.	Dr. Abdel-Raheem	Low power FIR filter design

Doaa	Abdel-Fattah	Ph.D.	Dr. Abdel-Raheem	Advanced Blind Equalization Algorithms
Nabih Jaber	Nabih Jaber	M.A.Sc.	Dr. Abdel-Raheem	Advanced Channel Estimation for DSRC Systems
S.M. Ali	Shahabi	M.A.Sc.	Dr. H. Wu	TBA
Saif	Rahman	M.A.Sc.	Dr. H. Wu	TBA
Mohammadali	Sharifan	M.A.Sc.	Dr. H. Wu	TBA
Karl	Leboeuf	M.A.Sc..	Dr. Muscedere	Development of a low cost, high speed machine vision system for pill inspection
Neil	Scott	M.A.Sc..	Dr. Muscedere	Development of a low cost, high speed machine vision system for pill inspection
Paresh	Bharkhada	M.A.Sc..	Dr. Muscedere	TBA
Sam	Farrokhi	Ph.D.	Dr. Muscedere	TBA
Anthony	Karloff	M.A.Sc.	Dr. Muscedere	Development of a low cost, high speed machine vision system for pill inspection
Prabhleen	K.Kalkat	M.A.Sc..	Dr. Mirhassani	TBA
Liton	Ghosh	M.A.Sc.	Dr. Chowdhury	Accurate Modeling of Load-Deflection Characteristics of AFM Microcantilevers Under Electrostatic Actuation
Ahmad	Sinjari	Ph.D..	Dr. Chowdhury	Design of MEMS Radar For Automotive Collision Avoidance
Syed	Abbas, Syed	M.A.Sc.	Dr. Chowdhury	Fabrication and measurements of a MEMS non-planar ultrasonic sensor Microarray

❖ **Current RCIM Students**

First name	Surname	Program	Supervisor	Thesis Title
Fang	Chen	Ph.D.	Dr. Erfani	"Implementation and Stability of High-Order Continuous-Time Sigma-Delta Modulators"
Yonghong	Xu	M.A.Sc.	Dr. Khalid	Efficient Quadratic Placement for FPGAs
Liao	Junsong	M.A.Sc.	Dr. Khalid	FPGA implementation of a Wireless Sensor Network
Marvan	Kannan	M.A.Sc.	Dr. Khalid	Processor Based Emulation Using FPGAs
Omar	Al Rayahi	M.A.Sc.	Dr. Khalid	A CAD Tool for Synthesizing Variants of Altera NIOS II Softcore Processor
Rongrong	Hu	Ph.D.	Dr. O'Leary	TBA
Jasmin Joseph	Thevaril	Ph.D.	Dr. O'Leary	TBA
Dongyun	Lu	M.A.Sc.	Dr. O'Leary	TBA

Graduate Student Summary

RCIM Faculty members are supervising 21 Masters and 16 Doctoral candidates. Over 70% of our graduate students were recipient of various scholarships from NSERC, OGS, and University of Windsor.

II. PROFESSIONAL ACTIVITIES of RCIM FACULTY MEMBERS

1. Dr. M. Ahmadi, Co-Chair of Tutorial Sessions 2007 IEEE International Conference on Circuits and Systems.(New Orleans)
2. Dr. M. Ahmadi, Co-Chair of the Best paper Award Committee, 2007 IEEE Midwest Symposium on Circuits and Systems.(Montreal)
3. Dr. M. Ahmadi, Track Chair and a member of the Technical Program Committee of 2007 IEEE International Conference on Electronics Circuits and Systems (Morocco)
4. Dr. M. Ahmadi, Member of the Steering Committee of IEEE Midwest Symposium on Circuits and Systems.
5. Dr. M. Ahmadi, Member of the NSERC Grant Selection Committee 334.
6. Dr. M. Ahmadi, Regional Editor for the Journal of Circuits, Systems and Computers.

7. Dr. M. Ahmadi, Associate Editor for the Pattern Recognition Journal

8. Dr. S. Chowdhury, Reviewer, Elsevier, Communications in Nonlinear Science and Numerical Simulations

9. Dr. S. Chowdhury, Reviewer, IEEE Sensors Journal

10. Dr. S. Chowdhury, Reviewer, IEEE Transactions on Circuits and Systems I

11. Dr. S. Chowdhury, Reviewer, Journal of Nanotechnology, Institute of Physics Publishing, Dirac House, Temple Back, Bristol, UK.

12. Dr. S. Chowdhury, Reviewer, Journal of Physics D: Applied Physics, Institute of Physics Publishing, Dirac House, Temple Back, Bristol, UK.

13. Dr. S. Chowdhury, Reviewer, Journal of Micromechanics and Microengineering, Institute of Physics Publishing, Dirac House, Temple Back, Bristol, UK.

14. Dr. S. Chowdhury, Represented University of Windsor in the Opening Ceremony of Advanced RF Testing Laboratory at the University of Manitoba, Winnipeg on September 7, 2006 as an invited guest.

15. Dr. S. Chowdhury, 2006-Was invited to participate in the CMC Microsystems, Canada's Technology Advisory Committee meeting (TAC97) to determine the future trend in Microsystem Technology and Canada's options

16. Dr. S. Chowdhury, 2007- Invited to participate in CMC Microsystems Focus Group meeting in Ottawa.

17. Dr. S. Chowdhury, 2007-Panel Member, OGS Scholarship.

18. Dr. C. Chen, served as a reviewer for a 2007 NSERC discovery grant proposal as well as many international journals and conferences.

19. Dr. E. Abdel-Raheem, Editorial Board Member, IET (formerly IEE) Signal Processing, Dec. 2007.

20. Dr. E. Abdel-Raheem, Associate Editor, Canadian J. Elec. & Comp. Eng. (CJECE) since Dec. 31st, 2006.

21. Dr. E. Abdel-Raheem, General Co-Chair, IEEE Int. Symposium on Signal Processing and Information Technology (ISSPIT), Cairo, Egypt, 15-18 Dec. 2007.

22. Dr. E. Abdel-Raheem, Session Chair, ISSPA, Feb. 12-15, 2007, Sharjah, UAE.

23. Dr. M. Khalid, Reviewer for IEEE Trans. on CAD, IEEE Trans. on VLSI and several IEEE sponsored conferences

24. Dr. M. Khalid, Reviewer for Journal of Circuits, Systems and Computers, published by World Scientific

25. Dr. M. Khalid, Panel Chair during 2007-2008 Ontario Graduate Scholarship (OGS) competition

26. Dr. M. Khalid, Reviewer for Canada Foundation for Innovation (CFI)

27. Dr. M. Khalid, Reviewer for Natural Sciences and Engineering Research Council (NSERC)

28. Dr. M. Khalid, Reviewer for CRC Press (book proposal review)

29. Dr. M. Khalid, Reviewer for Research Grants Council (RGC) of Hong Kong

30. Dr. S. O'Leary, Reviewer for grant proposals funded by Sharcnet

31. Dr. S. O'Leary, Reviewer for grant proposals funded by NSERC

32. Dr. S. O'Leary, Reviewer for grant proposals funded by NSERC

33. Dr. S. O'Leary, Reviewer for Journal of Thin Solid Films

34. Dr. S. O'Leary, Reviewer for Journal of Journal of Non-Crystalline Solids

35. Dr. S. O'Leary, Reviewer for Journal of Journal of Applied Physics Letters

36. Dr. S. O'Leary, Reviewer for Journal of Journal of IET Communications

37. Dr. S. Erfani, invited lecturer at IEEE Signal Processing, Long Island Section Meeting, Farmingdale, NY, May 15, 2007

38. Dr. S. Erfani, Member of Steering Committee, IEEE Midwest Symposium on Circuits and Systems

39. Dr. S. Erfani, Technical Advisory Board member, Journal of Network and Systems Management

III. SCHOLARY ACTIVITIES AND PUBLICATIONS

(a) Refereed Journal Publications

1. M. Mirhassani , M. Ahmadi, W.C. Miller, "A Feed Forward Time- Multiplexed Neural Network with Mixed–Signal Neuron–Synapse Arrays", Microelectronic Engineering Journal "VLSI Design and Test" Elsevier Science Series. Vol.84, pp300-307, 2007

2. S. Talakoub, L. Sabeti, B. Shahrrava, M. Ahmadi, "An Improved Max-Log-MAP Algorithm for Turbo Decoding and Turbo Equalization", IEEE Transactions on Instrumentation and Measurement.Vol.56, No.3, June 2007, pp1058-1063

3. R. Rashidzadeh, M.Ahmadi, W.C. Miller, "On-Chip Measurement of Waveforms in Mixed Signal Circuits Using a Segmented Subsampling Technique", Analog Integrated Circuits and Signal Processing. Vol. 50, No.2, pp105-113, Feb. 2007

4. R. Rashidzadeh, M.Ahmadi, W.C. Miller, "Test and Measurement of Analog and RF Cores in Mixed-Signal SoC Environment" IEEE Transactions on Computer Aided Design of Integrated Circuits and Systems, Vol.26, No. 10, Oct. 2007, pp1855-1865.

5. A. Hosseinzadeh Namin, H. Wu, M. Ahmadi, "Comb Architectures for Finite Field Multiplication in F2**m" IEEE Transactions on Computers. Vol. 54, No. 2, Feb. 2007, pp98-110.

6. A. Hosseinzadeh Namin, H. Wu, M. Ahmadi, "A New Finite Field Multiplier Using Redundant Representation", Accepted for publication in IEEE Transactions on Computers. Date of acceptance 4/24/2007

7. Williams, M. Ahmadi, W.C. Miller, "Design of 2-D FIR and IIR Filters with Canonic Signed Digit Coefficients using Singular Value Decomposition and Genetic Algorithms" Journal of Circuits, Systems and Signal Processing. Vol. 26, No. 1, 2007, pp69-89

8. M. Mirhassani, M. Ahmadi, G.A. Jullien "Low-Power Mixed Signal CVNS Based 64-Bit Adder for Media Signal Processing" accepted for publication in IEEE Trans. On VLSI, date of acceptance, Sept. 27, 2007, 24 manuscript pages.

9. M. Mirhassani, M. Ahmadi, G.A. Jullien " Robust Low- Sensitivity Adaline Neuron Based on Continuous Valued Number System " Accepted for publication in the Journal of Analog Integrated Circuits and Signal Processing. Date of acceptance 17/01/2008.

10. F. Chen, T. Kuendiger, S. Erfani, M.Ahmadi " Design of a Wideband low-power Continuous Time $\Sigma\Delta$ Modulator in 90 nm CMOS Technology" Accepted for publication in the Journal of Analog Integrated Circuits and Signal Processing. Date of acceptance 17/01/2008. 21 manuscript pages.

11. Jose Martinez-Quijada, Sazzadur Chowdhury, "A Bio-Mechanically Driven MEMS Power Generator for Cardiac Pacemaker Applications, Journal of Circuits, Systems, and Computers, (Submitted paper, Submission date; Sept. 25, 2007, 22 pages).

12. Matthew Meloche, Sazzadur Chowdhury, "Design of a MEMS Discretized Hyperbolic Paraboloid Geometry Ultrasonic Sensor Microarray", IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control (Accepted paper, Date of acceptance: January 17, 2008), 29 pages.

13. Andrew Tam, Sazzadur Chowdhury, "Exploiting Sonoluminescence to Realize a MEMS Ultrasonic Sensor", Journal of Circuits, Systems, and Computers, (Accepted paper, Date of acceptance: April 11, 2007. Tentative publication date, Vol. 17, no. 1, February 2008, 22 pages).

14. C. Chen, "Reliability-Driven Gate Replication for Nanometer-Scale Digital Logic,"IEEE Transactions on Nanotechnology (TNANO), vol. 6, no. 3, May 2007, pp. 303-308.

15. C. Kang and C. Chen, "Activity-Sensitive Clock Design for Low Power Consumption," The IEEE Canadian Journal of Electrical and Computer Engineering (CJECE), vol. 32, no. 4, October 2007, pp. 221-226.

16. Harb Abdulhamid, Kemal Tepe, and Esam Abdel-Raheem, Iterative Tracking Techniques for 5.9 GHz DSRC Applications, Accepted in Research Lett in Comm.., Hindawi, Jan. 2008.

17. Harb Abdulhamid, Esam Abdel-Raheem, and Kemal Tepe, 5.9 GHz DSRC Receiver for Wireless Access Vehicular Environments, IET Communications (formerly IEE Proc. on Comm.), in print (proofs submitted on Nov. 8th, 2007).

18. T. M. Mok and S.K. O'Leary, The dependence of the Tauc and Cody optical gaps associated with amorphous silicon on the film thickness: l Experimental limitations and the impact of curvature in the Tauc and Cody plots, Journal of Applied Physics, Volume 102, pages 113525-1-9, 2007.

19. W.C. Tan, G. Belev, K. Koughia, R. Johanson, S.K. O'Leary, and S. Kasap, Optical properties vacuum deposited and chlorine doped a-Se thin films: aging effects, Journal of Materials Science: Materials in Electronics, Volume 18, pages S429-S433, 2007.

20. Banovic, Kevin; Khalid, Mohammed; Abdel-Raheem, Esam, A Configurable Fractionally-Spaced Blind Equalizer for QAM Demodulators, Digital Signal Processing, 17(6), 1071-1088, November 2007.

21. Xu, Yonghong; Khalid, Mohammed, A Fast and Effective Timing-Driven Placement Tool for FPGAs, Journal of Circuits,Systems and Computers, World Scientific, (accepted Nov. 2007)

22. Banovic, Kevin; Abdel-Raheem, Esam; Khalid, Mohammed, Computationally Efficient Methods for Blind Decision Feedback Equalization of QAM Signals, AEU International Journal of Electronics and Communication, (accepted Sept. 2007).

(b) Refereed Conference papers

1. M.J. Islam, J. Wu, M.Ahmadi M. A. Sid-Ahmed, "Grey Scale Image Segmentation Using Minimum Error Thresholding Technique", Proc. of 6th International Conference for Upcoming Engineers, June 2007, Toronto Canada, "Recipient of Best Technical Paper Award Certificate"

2. A. Hosseinzadeh Namin, H. Wu, M. Ahmadi "A Bit-Serial Word-Parallel Finite Field Multiplier Using Redundant Basic in F 2**M", Proceedings of the Fourth IASTED Asian Conference on Communication Systems and Networks, April 2-4, 2007, Phuket, Thailand, pp 171-176

3. M. Mirhassani, M. Ahmadi, G.A. Jullien " Digital Multiplication Using Continuous Valued Digits", Proc of 2007 IEEE International Symposium on Circuits and Systems, May 2007, New Orleans ,USA, pp 3263-3266

4. T. Williams, M. Ahmadi, W.C. Miller, "A Graphical Transform for Subexpression Elimination Using Genetic Algorithms", To appear in the Proc. of 2007 Mid West Symposium on Circuits and Systems, Aug. 2007, Montreal Canada.

5. P. Samadi, M. Ahmadi, "Genetic Algorithm and Its Application for the Design of QMF Banks with Canonical Signed Digit Coefficients : A Comparative Study and New Results", To appear in the Proc. of 2007 Mid West Symposium on Circuits and Systems, Aug. 2007, Montreal Canada.

6. P. Samadi, M. Ahmadi "Performance Analysis of Genetic Algorithm for the Design of Linear Phase IIR Quadrature Mirror Filter Banks with Canonical Signed Digit Coefficients" to appear in the Proc. of 3rd International Conference on Natural Computation (ICNC'07) Aug. 2007, Haikou, China, pp150-154.

7. X. Xu, M. Ahmadi, "A Human Face Recognition System Using Neural Classifiers", Proc. of 4th International Conference on Computer Graphics, Imaging and Visualization CGIV'07, Aug. 14-17,2007, Bangkok, Thailand. Pp354-357.

8. I. El-Feghi, M. Galhoud, M.A. Sid-Ahmed, M.Ahmadi, "Three Level Gray-Scale Images Segmentation Using Non-extensive Entropy", Proc. of 4th International Conference on Computer Graphics, Imaging and Visualization CGIV'07, Aug. 14-17,2007, Bangkok, Thailand. Pp304-307.

9. I. El-Feghi, N. Adem, M.A. Sid-Ahmed, M. Ahmadi, "Improved Co-occurrance Matrix as a Feature Space for Relative Entropy-based Image Thresholding" Proc. of 4th International Conference on Computer Graphics, Imaging and Visualization CGIV'07, Aug. 14-17,2007, Bangkok, Thailand.pp314-317.

10. I. El-Feghi, H. Aboasha, M.A. Sid-Ahmed, M. Ahmadi "Content-Based Image Retrieval Based on Efficient Fuzzy Color Signature" Proc. of 2007 IEEE International Conference on Systems, Man and Cybernetics, Oct. 2007 Montreal, Canada pp1118-1124.

11. M.J. Islam, Q.M. Jonathan Wu, M. Ahmadi, M. A. Sid-Ahmed "Investigating the Performance of Naïve-Bayes Classifiers and K-Nearest Neighbor Classifiers" Proc. of ICCIT'07, Nov. 21-23, 2007, Hotel Hyundai, Gyeongju, Korea, pp1541-1546.

12. P. Samadi, M. Ahmadi " Common Subexpression Elimination for Digital Filters Using Genetic Algorithm" Proc. of 2007 IEEE Intern. Conf. on Electronic Circuits and Systems, Marrakech, Morocco, Dec. 11-14, 2007, pp 246-249.

13. Jianjun Li, M. Ahmadi " Realizing High Throughput Transforms of H.264/AVC" to appear in the proceedings of 2008 IEEE Intern. Symp. On Circuits and Systems.

14. M. Mirhassani, M. Ahmadi, G.A. Jullien " Robust Analog Neural Network Based on Continuous Valued Number System" to appear in the proceedings of 2008 IEEE Intern. Symp. On Circuits and Systems.

15. A. Hosseinzadeh-Namin , H. Wu, M. Ahmadi " A High Speed Word Level Finite Field Multiplier Using Reordered Normal Bases" to appear in the proceedings of 2008 IEEE Intern. Symp. On Circuits and Systems.

16. A. Nabatchian, E. Abdel-Raheem, M.Ahmadi " Human Face Recognition Using Different Moment Invariants: A Comparative Study" To appear in the proceedings of 2008 Intern. Cong. On Image and Signal Processing (CISP2008) 27-30 May 2008,Sanya ,China.

17. Lynn Yang, M. Ahmadi " A New Motion Estimation Architecture for Block- Matching Algorithm" to appear in the Proc. of 2008 IEEE Intern. Conf. on Networking, Sensing, and Control, April 6-8 ,2008, Sanya, China.

18. Jose Martinez-Quijada, Sazzadur Chowdhury, "A Two-Stator MEMS Power Generator for Cardiac Pacemakers", Proceedings of IEEE International Symposium on Circuits and Systems 2008 (ISCAS2008), (Accepted paper, Date of acceptance: January 5, 2008).

19. Ahmad Sinjari, Sazzadur Chowdhury, "MEMS Automotive Collision Avoidance Radar Beamformer", Proceedings of IEEE International Symposium on Circuits and Systems 2008 (ISCAS2008), (Accepted paper; Date of acceptance; January 5, 2008).

20. Andrew Tam, Sazzadur Chowdhury, "A MEMS Ultra-Stable Short Duration Current Pulse Generator", IEEE Computer Society Annual Symposium on VLSI 2007 (ISVLSI2007), May 9-11, 2007, Porto Alegre, Brazil. pp. 369-374.

21. Matthew Meloche, Sazzadur Chowdhury, "An Integrated Active Vehicle Safety System (IAVSS) to Improve Vehicle Dynamic Safety", XVII Canadian Multidisciplinary Road Safety Conference (CMRSC2007), Montreal, June 3-6, 2007. pp. 1-15.

22. Jose Martinez-Quijada, Sazzadur Chowdhury, "Body-Motion Driven MEMS Generator for Implantable Biomedical Devices", in Proceedings of 20th IEEE Canadian Conference on Electrical and Computer Engineering (CCECE2007), April 22-26, 2007, pp. 164-167.

23. S. Li, F. Zhou, C. Chen, H. Chen, and Y. Wu, "Quasi-Static Energy Recovery Logic with Single Power-Clock Supply," in Proc. of the 2007 IEEE International Symposium on Circuits and Systems (ISCAS'07), New Orleans, USA, pp. 2124-2127, May 2007.

24. C. Chen and F. Zhou, "Towards Reliability Improvement for Nanoelectronic Circuits Using Gate Replication," in Proc. of the 2007 7th IEEE International Conference on Nanotechnology (IEEE-Nano'07), Hong Kong, pp. 597-600, August 2007.

25. P. Bharkhada and C. Chen, "On the Behaviors of Multi-Island Structure for Single-Electron Threshold Logic Circuits," in Proc. of the 2007 7th IEEE International Conference on Nanotechnology (IEEE-Nano'07), Hong Kong, pp. 66-69, August 2007.

26. Y. Wu, F. Zhou, H. Chen, S. Li, and C. Chen, "High-Level Power Estimation with Improved Entropy for Considering the Temporally Correlated Signals", in Proc. of the 2007 IEEE International Conference on Communications, Circuits and Systems (ICCCAS'07), Fukuoka, Japan, pp. 1030-1033, July 2007.

27. Khalid M Khayyat, Fayez Gebali, and Esam Abdel-Raheem, Performance Analysis of the IEEE 802.11 DCF, IEEE Int. Symp. On Signal processing and Information Tech. (ISSPIT), Cairo, Egypt, 15-18 Dec. 2007.

28. Kevin Banovic, Mohammed A. S. Khalid, and Esam Abdel-Raheem, FPGA Implementation of Fractionally-Spaced Complex Blind Adaptive Equalizer, IEEE Int. Symp. On Signal processing and Information Tech. (ISSPIT), Cairo, Egypt, 15-18 Dec. 2007.

29. Harb Abdulhamid, Esam Abdel-Raheem, and Kemal Tepe, Channel Tracking Techniques for OFDM Systems in Wireless Access Vehicular Environment, Int. Symp. On Signal processing and its Applications (ISSPA), Sharjah, UAE, Feb. 2007

30. Kevin Banovic, Mohammed A. S. Khalid, and Esam Abdel-Raheem, FPGA Implementation of Fractionally-Spaced Complex Blind Adaptive Equalizer, Proc. of IEEE Int. Symp. On Signal processing and Information Tech. (ISSPIT), 2007.

31. Tong, Jason, G; Khalid, Mohammed, A.S., A Comparison of Profiling Tools for FPGA-Based Embedded Systems, Proceedings of Canadian Conference on Electrical and computer Engineering, 2007.

32. Yazdanshenas, Amir; Khalid, Mohammed, A New Scheduling Algorithm for Processor-Based Logic Emulation Systems, Proceedings of Midwest Symposium on Circuits and Systems, 2007.

33. Tong, Jason, G; Khalid, Mohammed, A.S., Profiling CAD Tools: A Proposed Classification, International Conference on Microelectronics, 2007.

34. Muscedere, Roberto, A Hardware Efficient Very Large Bit Word Binary to Double BaseNumber System Converter for Encryption Applications, IEEE International Symposium on Circuits and Systems (ISCAS) 2007, 1373 - 1376 pp, 2007

35. Muscedere, Roberto; Leboeuf, Karl, B, A Dynamic Address Decode Circuit for Implementing Range Addressable Look-Up Tables, IEEE International Symposium on Circuits and Systems (ISCAS) 2008, (In Press)

36. Karloff, Anthony, C.; Scott, Neil, E.; Muscedere, Roberto, A Flexible Design for a Cost Effective, High Throughput Inspection System for Pharmaceutical Capsules, IEEE Internaltion Conference on Industrial Technology, 2007 (In Press)

37. Azarmehr , Mahzad; Muscedere, Roberto, A Simple Central Processing Unit with Multi-Dimensional Logarithmic Number System Extensions, Application-specific Systems, Architectures and Processors, Application-specific Systems, Architectures and Processors, 2007 (In Press)

(c) Papers Presented at Special Workshops and Symposia

1. Ahmad Sinjari, Syed Abbas, Roberto Muscedere, Majid Ahmadi, Sazzadur Chowdhury, "MEMS Sensors for an Integrated Active vehicle Safety System (IAVSS)", North American International Auto Show (NAIAS 2008), Detroit, January 16-17, 2008. (Poster presentation).

2. Ahmad Sinjari, Syed Abbas, Sazzadur Chowdhury, "Small Wonders-Machines Smaller than Sand Particles Open the Way to a Safer, Healthier, and More Productive Future", Electrical Engineering Open house, July 19, 2007, Windsor, (Poster presentation).

3. C. Chen, IEEE International Symposium on Circuits and Systems (ISCAS'07), New Orleans, USA, May 2007

4. C. Chen, IEEE International Conference on Nanotechnology (IEEE-Nano'07), Hong Kong, August 2007.

IV.   LIST OF SEMINARS HELD IN 2007

- **A Low-Cost High-Speed Inspection System for Pharmaceutical Capsules**
  Nov. 09, 2007
  Presenter: Neil Scott & Anthony Karloff

- **Investigating the Performance of Naive- Bayes Classifiers and K- Nearest Neighbor Classifiers**
  Nov. 02, 2007
  Presenter: Mohammed Jahirul Islam

- **Research activities at the Intelligent Systems Research Lab., Deakin University**
  Oct. 3, 2007
  Presenter: Dr. Saeid Nahavandi

- **Edge Detection using Mathematical Morphology**
  Jun. 15, 2007
  Presenter: Neil Scott

- **Demosaicing with Improved Edge Direction Detection**
  Jun. 08, 2007
  Presenter: Anthony Karloff

- **An Adaptive Digital Image Watermarking Technique for Copyright Protection**
  Jun. 01, 2007
  Presenter: Mohammad J. Isalm

- **MEMS Automotive Collision Avoidance Radar beamformer**
  May 11, 2007
  Presenter: Ahmad Sinjari

- **Local Variations Method for Iris Recognition**
  May 04, 2007
  Presenter: Amirhosein Nabatchian

- **Using ESL Tools for FPGA Design**
  Apr. 27, 2007
  Presenter: Aws Ismail

- **Body-Motion Driven MEMS Generator for Implantable Biomedical Devices**
  Apr. 20, 2007
  Presenter: Jose Martinez-Quijada

- **Introduction to Static Timing Analysis with Prime Time**

Mar. 30, 2007
Presenter: Jiuling Tang

- **Common Sub-expression Elimination**
Mar. 23, 2007
Presenter: Payman Samadi

- **2-Dimensional Motion Estimation**
Mar. 16, 2007
Presenter: Elham Shahinfard

- **Complexity reduction for HW implementation of H.264/AVC**
Feb. 23, 2007
Presenter: Jianjun Li

- **Soft-Core Processors for Embedded Systems**
Feb. 16, 2007
Presenter: Dr. Khalid

- **The Signal Variable system and Transformation**
Jan. 19, 2007
Presenter: Dr. Erfani

V. AWARDS AND HONOURS

1. Dr. Ahmadi, The recipient of Dean's Special Recognition Award in recognition of excellence in research, scholarship and creative activity in December 2007.
2. M.J.Islam, Dr.J.Wu,Dr. Ahmadi, and Dr. M.A. Sid-Ahmed, The Recipient of Best Technical Paper Award Certificate from 2007 Internatioinal Conference for Upcoming Engineers, Toronto, Canada.
3. Dr. Chowdhury, University of Windsor Faculty Special Recognition Award for Research and Scholarly Achievement 2007.
4. Dr. Muscedere, Special Needs (OPUS) Campus Community Recognition Award, 2007

VI. GRANTS AND CONTRACTS RECEIVED BY THE RCIM MEMBERS

1. G.A. Jullien, M.Ahmadi,,R. Muscedere and 2 others, Integrated Systems for High Performance Signal Processing. NSERC-CRD with industrial support from Gennum. $292,770.00, 2007-2010

2. M. Ahmadi and 2 others , A Computer Vision-Based Quality Process Controller for Pharmaceutical Products OCE project with support from MMO, NSERC and Pharmaphil of Windsor, Ontario, $169,695.00, 2007-2009.

3. Dr. M.Ahmadi individual NSERC Discovery Grant, $52,500.

4. Dr. M.Ahmadi Research Support for RCIM from The University of Windsor $150,000.

5. Dr. S. Erfani, U. of Windsor Start Up $5000.

6. Dr. C. Chen, NSERC Discovery Grant $20,000.

7. Dr. C. Chen and Dr. O'Leary, NSERC-RTI grant $42,900.

8. Dr. S.K. O'Leary NSERC Discovery Grant Amount: $ 24,300 per year Years: 2007-2012.

9. Dr. E. Abdel-Raheem, NSERC Discovery Grant $13000.

10. Dr. M. Khalid, NSERC Discovery Grant $20,000.

11. Dr. S. Chowdhury, NSERC Discovery Grant $ 38,500 (2006-2007).

12. Dr. S. Chowdhury, Ontario Centres of Excellence $199,935 for "MEMS Sensors for Automotive Collision Avoidance" project (2007-2009).

13. Dr. R. Muscedere, NSERC Discovery Grant $17,000.

14. Dr. Huapeng Wu, NSERC Discovery Grant $10,000.

15. Dr. Mirhassani, University of Windsor startup research grants $30,000.

16. CMC contributions to RCIM totaled $779,832 for the 2007.The breakdown of the funding was as follows:

Hardware and Software	$390,52
Design Kits	$89,773
Fabrication	$290,364
Maintenance and other	$9,173
Total	**$779,832**

Total Grants received by RCIM members for 2007-2008 totals <u>$1,485,437</u>.

VII. GRADUATE COURSES TAUGHT BY RCIM MEMBERS

1. Dr. S. Erfani — 06-88-557: Network Security
2. Dr. S. Erfani — 06-88-523: System Theory
3. Dr. M. Ahmadi — 06-88-521 Digital Signal Processing
4. Dr. M. Ahmadi — 06-88-590 Motion Estimation
5. Dr. E. Abdel-Raheem — 06-88-551: Advanced Digital Signal Processing
6. Dr. M. Khalid — 06-88-560: Reconfigurable Computing
7. Dr. M. Khalid — 06-88-590: Physical Design Automation for VLSI and FPGAs
8. Dr. R. Muscedere — 06-88-531: VLSI Design
9. Dr. C. Chen — 06-88-541: Low Power CMOS Design
10. Dr. H. Wu — 06-88-555: Computer Arithmetic
11. Dr. H. Wu — 06-88-529: Discrete Transforms & Number Theoretical
12. Dr. S. Chowdhury — 06-88-552: Advanced Topics in MEMS
13. Dr. Ahmadi & Dr. Rashidzadeh — 06-88-590 : Advanced Analog Circuit Design
14. Dr. Majid Ahmadi — 06-88-525 : 2-Dimensional Digital Signal Processing

VIII. COLLABORATIVE RESEARCH WITH THE PRIVATE SECTOR

Gennum Corporation , 970 Fraser Drive, Burlington, Ontario L7L 5P5

*Principal Investigator:***Dr. G.A. Jullien/** Dr. M. Ahmadi,

Project: Integrated Systems for High Performance Signal Processing. NSERC-CRD with industrial support from Gennum

Pharmaphil , 3190 Devon Rd , Windsor, Ontario N8X 4L2

Principal Investigator: Dr. M. Ahmadi

Project: A Computer Vision-Based Quality Process Controller for Pharmaceutical Products OCE project with support from MMO, NSERC and Pharmaphil of Windsor, Ontario

Canadian Bank Note Company, 145 Richmond Rd Ottawa, ON , K1Z 1A1

Principal Investigator: Dr. M. Ahmadi

Project: FD- Document Authentication. Contract Research

IntellliSense Software Inc. 600 West Cummings Park, Suite 2000, Woburn, MA,

Project: Collaborative research partnership. Worth $210030 CAD per annum

Principal Investigator: Dr. S. Chowdhury

Canadian Microsystems Corporation, 210A Carruthers Hall, Kingston, Ontario, Canada K7L 3N6

Principal Investigators: M.Ahmadi, C. Chen, W.C. Miller, .S. Chowdhury, . R. Muscedere

Project: System-on-Chip (SoC) Design Methodology, Authoring IP Cores